

Annual Project Report January 2018 to January 2019

Project title	Fostering populations of arbuscular mycorrhizal fungi through cover crop choices and soil management		
Project number	21140024		
Start date	08/01/2018	End date	07/01/2021

Project aim and objectives

The overall aim of this project is to quantify how cover crops influence colonisation and populations of arbuscular mycorrhizal fungi (AMF) and how this interaction influences crop growth and yield in field conditions. The study will utilise field-scale trials, as well as glasshouse experiments, to address the following project aims:

1. To assess the impact of cover crop species on soil health, including the diversity and abundance of AMF.
2. To quantify the effect of increased diversity and abundance of AMF species on crop yield, under a range of soil, inoculation and physico-chemical conditions.
3. To consider the impact of common farm practices, such as cultivation, nutrient application and use of herbicides, on AMF diversity and abundance.

Key messages emerging from the project

Data from the first year were collected from the Innovative Farmers (IF) 'Increasing Nutrient Efficiency From Anaerobic Digestate' project. This project, which includes seven sites in the East of England, considers the interaction between cover crops and autumn application of nutrient rich anaerobic digestate (AD), focusing on soil health parameters, including populations of AMF.

Analyses indicated that cover crops were effective at stabilising soil nitrogen (N), especially in deeper soil horizons below 30cm depth. Furthermore, application of AD increased soil organic matter at some sites, but had no effect on cover crop growth.

Application of AD reduced overall colonisation of the cover crop by mycorrhizal fungi, but variation within sites was not statistically significant in most cases. Interestingly, a negative correlation emerged between AMF colonisation of the highly mycorrhizal vetch cover crop, and biomass of non-mycorrhizal fodder radish. Neither cover crops, nor the addition of AD influenced mycorrhizal colonisation or biomass of the following maize crop.

The results described in this summary report are interim and relate to one year. In all cases, the reports refer to projects that extend over a number of years.

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Summary of results from the reporting year

Despite other studies indicating that cover-cropping was an effective way to increase AMF colonisation of following cash crops, data from this experiment did not indicate significant changes in colonisation rates due to cover crop, or AD digestate amendment treatments. This may have been caused by an unusually hot and dry summer, which limited the growth, colonisation and subsequent effectiveness of AMF to provide the plant with nutrients or other benefits. This result will be compared to experiments in subsequent years, which experience different weather conditions.

Early results suggest that cover crops are likely to be colonised by different AMF species, and that treatments, such as application of AD, affect these populations in different ways. Furthermore, the interaction with non-mycorrhizal cover crops such as radish was an interesting result, which will be explored in future experiments.

More broadly, cover crops were beneficial to certain aspects of soil health, including the stabilisation and uptake of soil N, particularly in lower soil horizons. This may help to reduce N diffuse pollution from volatilisation and leaching, and be particularly important to farmers in NVZs.

Key issues to be addressed in the next year

Field trials will continue into 2019, and will include the New Farming Systems experiment at the NIAB Regional Centre at Morley in Norfolk, as well as a replicated cover crop/AMF inoculant trial. Glasshouse experiments will also run during 2019. These will explore how specific species of AMF colonise cereal crops and their contribution to plant growth.

Molecular approaches to determine AMF species diversity colonising the cover crops were being optimised in the latter months of this reporting year, and should be finalised in the coming months. This will allow increased insight into how cover crops influence the diversity of mycorrhizal symbionts, and whether they associate with following cash crops.

Lead partner	University of Cambridge
Scientific partners	NIAB
Industry partners	PlantWorks
Co-sponsor	AgriFood Charities Partnership

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Has your project featured in any of the following in the last year?	
<i>Events</i>	<i>Press articles</i>
Young Innovators Forum – Morley (23/3/18) Cereals (14/6/18) Royal Norfolk Show – Poster (26/6/18–27/6/18) BBRO Workshop at Morley (21/6/18)	
<i>Conference presentations, papers or posters</i>	<i>Scientific papers</i>
Agritech East week (5/11/18–9/11/18)	
<i>Other</i>	
Innovative Farmers Field Lab partners meeting presentation	

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